UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/759,838	01/16/2004	Hiroaki Tomofuji	FUJI 20.881	8736

26304 7590 09/17/2007
KATTEN MUCHIN ROSENMAN LLP
575 MADISON AVENUE
NEW YORK, NY 10022-2585

EXAMINER	
LIU, LI	
ART UNIT	**PAPER NUMBER**
2613	
MAIL DATE	**DELIVERY MODE**
09/17/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/759,838	TOMOFUJI ET AL.	
	Examiner	Art Unit	
	Li Liu	2613	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *09 July 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-10* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-10* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *16 January 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments with respect to claims 1-10 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1, 3-8 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bergano (US 6,137,604) in view of Konishi (US 2001/0048540) and Tomofuji et al (WO 02/30026; note: the corresponding English translation of WO 02/20026 can be found in US 2003/0215233).

1). With regard to claim 1, Bergano discloses an apparatus (Figure 3) for compensating for dispersion, comprising:

a wavelength-selective optical routing unit (Wavelength Router 303 in Figure 3) which receives at one input port thereof a signal into which a plurality of wavelengths (Figure 4 shows the wavelengths) are multiplexed, and demultiplexes the signal so as to output the demultiplexed wavelengths at desired output ports (Figure 3 shows 1, 2, 3, ... N output ports) while routes of the demultiplexed wavelengths leading to the output ports (Figure 3, column 5 line 6-14);

a plurality of dispersion compensation units (dispersion compensation equalizing fiber 304_1, 304_2, 304_3, ..., 304_N, in Figure 3) which are connected to the respective output ports, and have respective, different dispersion values (column 4 line 20-26); and

a multiplexing unit (Wavelength router 305 in Figure 3) which receives at a plurality of input ports thereof the demultiplexed wavelengths output from said dispersion compensation units, and multiplexes the demultiplexed wavelengths to generate a signal (emerging on fiber 306 in Figure 3, column 5 line 1-14).

In Figure 3, Bergano discloses wavelength router. But, Bergano does not expressly disclose a wavelength-selective optical switching route and switching routes of the demultiplexed wavelengths leading to the output ports.

However, using switching routing so that one wavelength band can be switch to any one of dispersion compensating elements specific is well known in the art. Konishi teaches a system and method (Figures 2 and 3) in which a plurality of dispersion compensators are used to compensate for various degrees of waveform distortion due to dispersion distortion in the optical transmission line by having different dispersion compensating characteristics, and a selection switch selects one of the dispersion compensators and connects the output with the selected dispersion compensator; so if the optical transmission line is changed, the dispersion compensating means such as DCF in the optical transmitting device will not have to be changed. But, in Konishi's system, Figures 2 and 3, the switch only routes one input to selected one of the dispersion compensators. However, Tomofuji et al teaches a demultiplexer which is a wavelength selection element that demultiplexes input singal in accordance with

wavelength band (Figure 1, and 40A in Figure 14), the switchs in the demultiplexer switch light input from the demultiplexer at the input port to be output from any one of the m output ports; that is the demultiplexer in Figure 1A and Figure 14) "switching routes of the demultiplexed wavelengths leading to the output ports".

Bergano teaches a wavelength router for managing dispersion in a WDM system, and Konishi discloses a switching route to select one of the dispersion compensators so that a flexible dispersion compensation can be performed according to various dispersion characteristics of optical transmission lines, and then Tomofuji et al teaches a switching route for a WDM system so to switch the light input from a demultiplexer at a input port to be output from any one of the m output t ports.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to apply the switching route as taught by Konishi and Tomofuji et al to the system of Bergano et al so that the respective wavelengths demultiplexed can be switched to different dispersion compensators according to the characteristics of the wavelengths and transmission line, and then the system of the dispersion compensation is made much more flexible and efficient.

2). With regard to claim 3, Bergano and Konishi and Tomofuji et al disclose all of the subject matter as applied to claim 1 above. Bergano teaches that the multiplexing unit (305 in Figure 3) receives a specific wavelength from a specific input port among the plurality of input ports (N input ports in Figure 3) and multiplexes said specific demultiplexed wavelength output by said plurality of dispersion compensation units into signal (the output 306 in Figure 3).

But, Bergano does not disclose the details of the wavelength router; that is Bergano does not teach wherein said multiplexing unit receives a specific wavelength from a specific input port among the plurality of input ports and multiplexes said specific demultiplexed wavelength into a plurality of demultiplexed wavelengths output by said plurality of dispersion compensation units.

However, Tomofuji et al discloses a multiplexing unit (the multiplexing section 40B in Figure 14) which receives a specific wavelength from a specific input port among the plurality of input ports (the m input ports to multiplexing section 40B, Figure 14) and multiplexes said specific demultiplexed wavelength into a plurality of demultiplexed wavelengths (the outputs P1, P2, ..., P2m in Figure 14) output by a plurality of attenuation units (42-1, ..., 42-m in Figure 14).

Tomofuji et al provides a WDM optical communication system that can efficiently arrange wavelengths of optical signals of a plurality of bit rates at different wavelength spacing, and can respond to the upgrade to higher bit rates flexibly. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to apply the multiplexing unit as taught by Tomofuji et al to the system of Bergano et al so that the switching of the optical signal at different wavelengths can be made more flexible and efficient.

3). With regard to claim 4, Bergano discloses an apparatus (Figure 9) for compensating for dispersion, comprising:

an optical circulating unit (Circulator 903 in Figure 9) which includes a first port (910 in Figure 9), a second port (920 in Figure 9) and a third port (930 in Figure 9), and

which receives at the first port a first signal (signal from fiber 902 in Figure 9) into which a plurality of wavelengths is multiplexed (Figure 4 shows the wavelengths) so as to output from the second port the first signal (the output from 920 is input to router 904), and receives a second signal (the signal from the router 904 in Figure 9) at the second port so as to output from the third port the second signal (the signal 908 is output from the third port 930 in Figure 9);

a wavelength-selective optical routing unit (the Wavelength Router 904 in Figure 9) which receives from said second port and at one input port a signal into which said plurality of wavelengths are multiplexed and demultiplexes the signal so as to output the demultiplexed wavelengths at desired output ports (N output ports in Figure 9) while routes of the demultiplexed wavelengths leading to the output ports; and

a plurality of dispersion compensation units (the dispersion equalizing fibers 905_1 ... 905_N in Figure 9) which are connected to the respective output ports of said wavelength-selective optical switching unit, and have respective, different dispersion compensation values (column 4 line 20-26); and

a plurality of reflecting units (the reflecting mirror 907_1 ..., 907_N in Figure 9) which reflect and return output light at end section of said respective dispersion compensation units (column 7, line 51-56).

In Figure 9, Bergano discloses wavelength router. But, Bergano does not expressly disclose a wavelength-selective optical switching route and switching routes of the demultiplexed wavelengths leading to the output ports.

However, using switching routing so that one wavelength band can be switch to any one of dispersion compensating elements specific is well known in the art. Konishi teaches a system and method (Figures 2 and 3) in which a plurality of dispersion compensators are used to compensate for various degrees of waveform distortion due to dispersion distortion in the optical transmission line by having different dispersion compensating characteristics, and a selection switch selects one of the dispersion compensators and connects the output with the selected dispersion compensator; so if the optical transmission line is changed, the dispersion compensating means such as DCF in the optical transmitting device will not have to be changed. But, in Konishi's system, Figures 2 and 3, the switch only routes one input to selected one of the dispersion compensators. However, Tomofuji et al teaches a demultiplexer which is a wavelength selection element that demultiplexes input singal in accordance with wavelength band (Figure 1, and 40A in Figure 14), the switchs in the demultiplexer switch light input from the demultiplexer at the input port to be output from any one of the m output ports; that is the demultiplexer in Figure 1A and Figure 14) "switching routes of the demultiplexed wavelengths leading to the output ports".

Bergano teaches a wavelength router for managing dispersion in a WDM system, and Konishi discloses a switching route to select one of the dispersion compensators so that a flexible dispersion compensation can be performed according to various dispersion characteristics of optical transmission lines, and then Tomofuji et al teaches a switching route for a WDM system so to switch the light input from a demultiplexer at a input port to be output from any one of the m output t ports.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to apply the switching route as taught by Konishi and Tomofuji et al to the system of Bergano et al so that the respective wavelengths demultiplexed can be switched to different dispersion compensators according to the characteristics of the wavelengths and transmission line, and then the system of the dispersion compensation is made much more flexible and efficient.

4). With regard to claim 5, Bergano and Konishi and Tomofuji et al disclose all of the subject matter as applied to claim 1 above. Bergano further discloses wherein the apparatus for compensating for dispersion is provided along an optical transmission line (Figure 1, Dispersion Equalizers 105 in provides along the optical transmission line 100, column 3 line 14-20).

5). With regard to claim 6, Bergano and Konishi and Tomofuji et al disclose all of the subject matter as applied to claim 1 above. Bergano further discloses that the dispersion compensation values in each of the plurality of compensating fibers are selected so that the average chromatic dispersion of the concatenated transmission spans 104 upstream from the dispersion compensator 105 and the equalizing sections 202 and 205 are substantially returned to zero at each of the center wavelengths λ_N. That is the respective dispersion compensation units have different dispersion compensation values.

Although Bergano doesn't specifically disclose wherein the respective dispersion compensation units are set to have the dispersion compensation values at regular intervals, such limitation is merely a matter of design choice and would have been

obvious in the system of Bergano. Bergano teaches that different dispersion compensation values are used for different wavelength bands. The limitation in claim 6 do not define a patentably distinct invention over that in Bergano since both the invention as a whole and Bergano are directed to use different dispersion values to compensate the dispersions of different wavelength channels. Therefore, to set the dispersion units to have dispersion compensation values at regular intervals or non-regular intervals would have been a matter of obvious design choice (based on the wavelength bands) to one of ordinary skill in the art.

6). With regard to claim 7, Bergano and Konishi and Tomofuji et al disclose all of the subject matter as applied to claim 1 above. Bergano further teaches that the apparatus for compensating for dispersion comprises an optical loss adjusting unit (307_1, 307_2, ..., 307_N in Figure 3) which variably adjusts an optical loss of the respective demultiplexed wavelengths from the respective input ports to said one output port (column 5, line 11-14).

But, Bergano does not disclose wherein the multiplexing unit comprises a wavelength-selective optical switching unit which receives at the plurality of input ports thereof the demultiplexed wavelengths and multiplexes said demultiplexed wavelengths so as to output the signal at the output port while switching the routes of the demultiplexed wavelengths leading to the output port.

However, Tomofuji et al discloses wherein the multiplexing unit (the multiplexing section 40B in Figure 14) comprises a wavelength-selective optical switching unit (11-1, 11-2, ..., 11-2m in Figure 14) which receives at the plurality of input ports (each switch

has m input ports in Figure 14) thereof the demultiplexed wavelengths and multiplexes said demultiplexed wavelengths so as to output the signal at the output port (the output P1, P2, ..., P2m in Figure 14) while switching the routes of the demultiplexed wavelengths leading to the output port.

Tomofuji et al provides a WDM optical communication system that can efficiently arrange wavelengths of optical signals of a plurality of bit rates at different wavelength spacing, and can respond to the upgrade to higher bit rates flexibly. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to apply the switch unit as taught by Tomofuji et al to the system of Bergano et al so that the switching of the optical signal at different wavelengths can be made more flexible and efficient.

7). With regard to claim 8, Bergano and Konishi and Tomofuji et al disclose all of the subject matter as applied to claims 1 and 6 above. Bergano further discloses an apparatus for compensating for dispersion (Figure 3), comprising

a plurality of apparatuses for compensating for dispersion (Figure 1), each of which has an identical structure to the apparatus for compensating for dispersion (column 3, line 14-20, Figure 1 "shows a single period of the dispersion map consisting of optical amplifiers 103, spans of transmission fiber 104, and dispersion compensator 105. In a typical long-haul system, this series of components constituting the dispersion map period might be **repeated a number of times** over the length of the system"); and

a different dispersion compensation value, per apparatus for compensating for dispersion, which is set at regular intervals in the dispersion compensation units within

each of the apparatus for compensating for dispersion (column 4, line 20-26, the dispersion compensation values in each of the plurality of compensating fibers are selected so that the average chromatic dispersion of the concatenated transmission spans 104 upstream from the dispersion compensator 105 and the equalizing sections 202 and 205 are substantially returned to zero at each of the center wavelengths λ_N).

Although Bergano doesn't specifically disclose wherein the respective dispersion compensation units are set to have the dispersion compensation values at regular intervals, such limitation is merely a matter of design choice and would have been obvious in the system of Bergano. Bergano teaches that different dispersion compensation values are used for different wavelength bands. The limitation in claim 6 do not define a patentably distinct invention over that in Bergano since both the invention as a whole and Bergano are directed to use different dispersion values to compensate the dispersions of different wavelength channels. Therefore, to set the dispersion units to have dispersion compensation values at regular intervals or non-regular intervals would have been a matter of obvious design choice (based on the wavelength bands) to one of ordinary skill in the art.

8). With regard to claim 10, Bergano and Konishi and Tomofuji et al disclose all of the subject matter as applied to claims 1, 6 and 8 above. And Bergano further discloses a wavelength division multiplexing communications system (Figures 1 and 3), comprising a plurality of apparatuses for compensating for dispersion at different locations along an optical transmission line, said plurality of apparatuses for compensating for dispersion being each identical to the apparatuses for compensating

for dispersion (column 3, line 14-20, Figure 1 "shows a single period of the dispersion map consisting of optical amplifiers 103, spans of transmission fiber 104, and dispersion compensator 105. In a typical long-haul system, this series of components constituting the dispersion map period might be **repeated a number of times** over the length of the system").

4. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bergano (US 6,137,604) and Konishi (US 2001/0048540) and Tomofuji et al (WO 02/30026) as applied to claim 1 above, and in further view of Tomofuji et al (US 2002/0149818).

Bergano and Konishi and Tomofuji et al (US '026) disclose all of the subject matter as applied to claim 1 above. But Bergano does not teach wherein said wavelength-selective optical switching unit further includes a specific output node that is not connected to the dispersion compensation units, and outputs a specific demultiplexed wavelength from the specific output port.

However, Tomofuji et al (US '818) discloses an apparatus (Figures 1, 4, 14, 22 and 25) for compensating for dispersion (dispersion compensator 3 in Figures 4, 14, 22 and 25), wherein said wavelength-selective optical switching unit further includes a specific output node (e.g., the add/drop nodes 5, 6, 7 and 8 in Figures 4, 14, 22 and 25) that is not connected to the dispersion compensation units, and outputs a specific demultiplexed wavelength from the specific output port.

By making the add/drop of optical signal with the compensation node, Tomofuji et al (US '818) makes the add/drop function feasible along the optical transmission line. Therefore, it would have been obvious to one of ordinary skill in the art at the time the

invention was made to apply the add/drop node as taught by Tomofuji et al (US '818) to the apparatus of Bergano et al and Konishi and Tomofuji et al (US '026) so to get a specific output node possible and also make the system more flexible.

5. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bergano (US 6,137,604) and Konishi (US 2001/0048540) and Tomofuji et al (WO 02/30026) as applied to claim 1 above, and in further view of Marom et al (US 2002/0196520).

Bergano and Konishi and Tomofuji et al disclose all of the subject matter as applied to claim 1 above. But, Bergano does not expressly disclose wherein said wavelength-selective optical switching unit includes a first diffraction device which spectroscopes input light; a plurality of mirrors which switch routes of wavelengths spectroscoped by said diffraction device; and a second diffraction device which receives from said plurality of mirrors the spectroscoped wavelengths and multiplexes the spectroscoped wavelengths.

However, Marom et al, in the same field of endeavor, discloses a programmable optical multiplexer/demultiplexer, in which the wavelength-selective optical switching unit includes a first diffraction device (grating 550 in Figure 5) which spectroscopes input light; a plurality of mirrors (560 in Figure 5) which switch routes of wavelengths spectroscoped by said diffraction device; and a second diffraction device (the grating 550 in Figure 5) which receives from said plurality of mirrors the spectroscoped wavelengths and multiplexes the spectroscoped wavelengths (page 3, [0026] and [0027]).

Marom et al provides the device for selectively multiplexing, demultiplexing and switching of optical channels in DWDM communication systems. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to apply the wavelength-selective switching unit as taught by Marom et al to the system of Bergano et al so that the switching of the optical signal at different wavelengths can be easily controlled and the routing of the wavelengths can be made more convenient.

Conclusion

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Taga et al (US 6,181,449, US 6,377,375) discloses a WDM processing device with dispersion equalizer elements.

Cao (US 6,731,877) discloses a high capacity ultra-long haul dispersion managed system.

Harney et al (US 2003/0175029) discloses an OADM along the transmission line.

Lin et al (US 6,668,115) discloses a dispersion compensation module.

Zhou et al (US 6,445,850) discloses an apparatus for per-band compensation..

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Li Liu whose telephone number is (571)270-1084. The examiner can normally be reached on Mon-Fri, 8:00 am - 5:30 pm, alternating Fri off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ken Vanderpuye can be reached on (571)272-3078. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Li Liu
September 9, 2007

KENNETH VANDERPUYE
SUPERVISORY PATENT EXAMINER